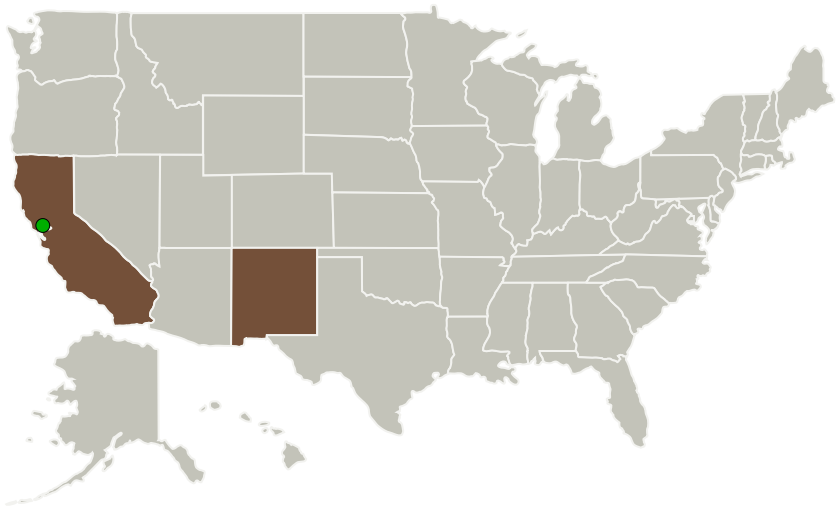
Compact CO2 Instrumentation for Small Aerial Platforms, Phase I

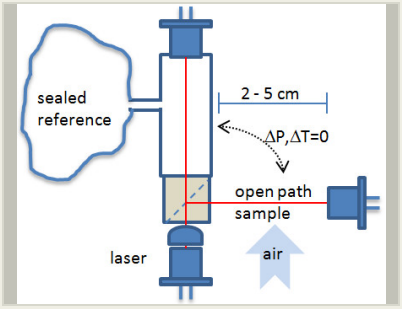
Completed Technology Project (2017 - 2017)

Project Introduction

Over the past decade, the importance of understanding the sources and sinks of carbon dioxide and other greenhouse gases has been recognized. A variety of research studies funded by NASA, DOE and NOAA to measure the fluxes of CO2 from average conditions have been performed. In particular, flux measurements of CO2 in the boundary layer are critical toward understanding the carbon budget for this important greenhouse gas. The World Meteorological Organization has met its goal of 0.1 ppm CO2 accuracy for land based field sensors with gas chromatography and non-dispersive infrared instruments. However, these instruments are poorly suited for small aerial platforms because of their high power requirements, large size and/or weight specifications. This proposal directly addresses NASA's need for high accuracy, small aerial platform, CO2 instrumentation for their Sierra and Dragon Eye UAVs, other unmanned aircraft such as launched and tethered balloons, and remote, unattended ground platforms where low power, compactness and self calibration are important. This instruments fits in with NASA's Technology Roadmap for satellite validation under the ASCENDS program and the OCO-2 mission, as well as independent high resolution, non-integrated CO2 profiles. To address this instrumentation need, Southwest Sciences proposes to develop a compact (< 1 L), low power (< 2 watts), light weight (~1kg) diode laser based instrument designed to achieve dry-air corrected, high accuracy measurements of CO2. We will target NASA's desired accuracy of 1 ppm CO2 (~1 part in 400) or better in 1 second or less using wavelength modulation spectroscopy in the 2.7 micron CO2 absorption band.

Primary U.S. Work Locations and Key Partners





Compact CO2 Instrumentation for Small Aerial Platforms, Phase I Briefing Chart Image

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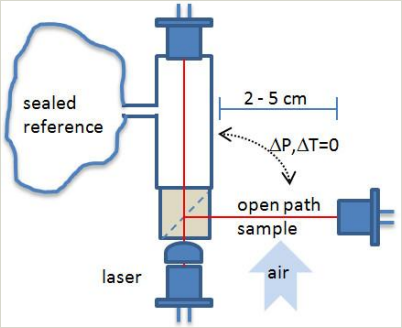
Organizations Performing Work	Role	Type	Location
Southwest Sciences, Inc.	Lead Organization	Industry	Santa Fe, New Mexico
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	New Mexico

Images



Briefing Chart Image
Compact CO2 Instrumentation for Small Aerial Platforms, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/133405)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Southwest Sciences, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

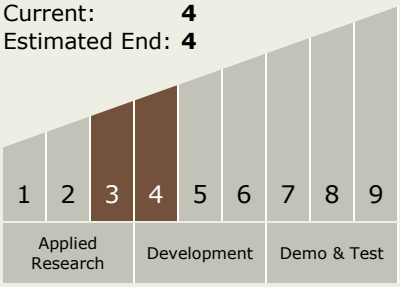
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Anthony M Gomez

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors